

# Land Use Patterns and Economic Development of Ikeja in Lagos State, Nigeria: The Geographic Information System Approach

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## ABSTRACT

*Population growth has led to high demand for residential and commercial land use. GIS has become a powerful tool for generating and analysing geographic features. This study obtains and analyzes varying land use patterns in Ikeja, local government area, Lagos State, Nigeria. In it, existing maps, aerial photographs and high resolution satellite imagery and data acquired with hand held GPS were used in analysing the changes that have occurred in the use of land in the study area from 1962 - 2004. AutoCAD 2006 was used in digitizing and geo-referencing while ArcView and ArcGIS 9.2 were used in overlaying and analysing of the land use pattern. The research found out that the airport area that occupies 2.5% of land use coverage rose to 22.88% in 1994 and 22.84% in 2004. The Built up area rose from 6.55% in 1962 to 63.90% in 1994 and to 67.99% in 2004. Vegetation cover decreased from 65.23% in 1962 to 6.43%, 5.97% in 1994 and 2004 respectively. Undeveloped area decreased from 25.68% in 1962 to 6.79% in 1994 and 3.20% in 2004. It is recommended among others that government and other stakeholders should monitor land-use pattern in Lagos for effective utilization.*

**Keywords:** *Land use, residential, commercial, GIS, GPS.*

## INTRODUCTION

Land is the habitat of man and its use is crucial for the economic, social and environmental advancement of all countries and indeed for human survival. In Dale and McLaughlin, (1989), Sir Bernard Binns observes that the land is man's most valuable resource. It is indeed much more than this; it is the means of life without which he could never have existed and on which his continued existence and progress depends. Land use involves both the manner in which the biophysical attributes of the land are manipulated and the intent underlying that manipulation - the purpose for which the land is used" (Turner and Meyer, 1995). Land use is the way in which, and the purpose for which, human beings employ the land and its resources. In another form, land use "denotes the human employment of land (Turner and Meyer, 1995). Skole (1994) states that land use itself is the human employment of a land-cover type, the means by which human activity appropriates the results of net primary production (NPP) as determined by a complex of socio-economic factors. More so, in a seminar report on land administration for the Food and Agricultural Organisation of the United Nations (FAO), Sir Bernard Binns (1953) states that land use

concerns the function or purpose for which the land is used by the local human population and can be defined as those human activities which are directly related to land, making use of its resources or having an impact on them (Binns, Sir Bernard, 1953). Metropolitan areas in Nigeria are growing at an unprecedented rate, creating extensive urban landscapes. Changes in the uses of land occurring at various spatial levels and within various time periods are the material expressions, among others, of environmental and human dynamics and of their interactions which are mediated by land. These changes sometimes have beneficial and detrimental effects on the economy. The latter being the chief cause of concern as they impinge variously on human well-being and welfare. Hence, information on the use of land is needed so that planning can be effectively monitored for better understanding of the rate of development in a place as well as a better prospecting of the future effect of land use changes and other land use activities. Land use change is an undeniable and significant global, ecological trend and has been a critical issue for planning and management of resources and for modernization agenda in most developing countries. The increase in the rate of development in an area will require the demand for various amenities such as roads and other facilities that will aid the movement of people from one place to another. Hamilton (1968) believes that the need for large amount of space, production processes that could be dangerous or obnoxious in nature, determines the location of some activities (such as chemical complexes, cemetery, sewage disposal centres, mechanic villages and a host of others).

The Environmental Systems Research Institute (ESRI) (2001) defines GIS as an organized collection of hardware, software, geographic data and personnel designed to efficiently capture, store, update manipulate, analyze and display of all forms of geographically referenced information. Certain complex operations are possible with GIS that would otherwise, have been difficult, time consuming and impracticable. Remote sensing and the GIS technology have been recognized and used as powerful and effective tools to monitor land usage and surface changes. Satellite remote sensing collects multi-spectrum, multi-resolution, multi-period data and provides valuable information in understanding and monitoring the process of land use change, and in constructing land use databases. It also helps in the provision of geographical understanding of the area it represents with respects to the roads present, the areas built up and other important geographic features.

Thirumalaiivasan and Guruswamy (2000) in their work entitled: Optimal route analysis using GIS (1999 - 2000), made use of the Chennai City, the largest City in India as a case study establish the fact that GIS and remote sensing play a very important role in the transportation and urban planning applications. Moreso, Issa (2000) also made a clear fact that Geographic Information System (GIS) and Remote Sensing are typically fields needed in the urban transportation planning and this planning includes the analysis of route network. The study area used was the Birkenhead, Auckland City. In the work, the bus routes were analysed. There were bus services that helped in the handling of the trips in the area and these bus services covered typical land use areas such as the residential, commercial, industrial, and educational land use locations in the study area. Hence the time required to move people from one land use location to the other was well analysed. GIS combines

geographic data and other types of information to generate visual maps and reports. Burroughs (1986), notes that GIS uses geographic location to relate otherwise disparate data and provides a systematic way to collect and manage location-based information crucial to organization to explore a range of possible scenario and obtain an idea of the consequences of a course of action before the mistakes have been irrevocably made to the landscape itself. Hence, this study is not only concerned with the analysis of the use of land in Ikeja Local Government using aerial photograph, existing maps and satellite imagery but also concerned with the analysis of the route network present and how these respective land use locations can be accessed or located optimally in the area. More so a better understanding of the rate of development, the nature of the land use change with respect to population density and the future impact of the population growth in the Ikeja Local Government will be obtained. The results of these evaluations may be used to suggest land use alternatives that would contribute to the attainment of an improved environment. In addition to all of these purposes, an important purpose for conducting such analyses is to predict future changes in land use.

## METHOD

Ikeja Local Government is typically the capital of Lagos State in Nigeria. It is situated at the north central part of Nigeria and lies between 534852.711E, 736000.000N (meters) and 542856.500E, 736011.605N (meters). It shares its western boundary with Agege Local Government as well as Alimosho Local Government. Ikeja has its eastern boundary with Kosofe Local Government. It also maintains its southern boundary with the Oshodi/Isolo and Mushin Local Governments and its Northern boundary coincides with the boundary of Lagos State.

The data used in the study include: Aerial photographs of the year 1962, covering the study area from Federal surveys at Lagos Island. Existing topographic map with a scale of 1:50,000, prepared in 1964 (from the aerial photograph of 1962) of the study area which was obtained from Federal Surveys at Lagos Island. Paper print out covering the area of interest in the study area in the year 1981 from the office of the Surveyor General, Alausa, Ikeja, Lagos. Existing Map for the year 1994, covering the Ikeja Local Government from the office of the Surveyor General, Alausa, Ikeja, Lagos. Satellite imagery for the year 2004, covering the Ikeja Local Government region was obtained. Population data of the study area obtained from the National Population Commission at Surulere, Lagos. These data consist of the population census of the study area as of the years 1963, 1991 and 2006. Projected population census of 1996 was also obtained. Hand held GPS was used to obtain co-ordinates for geo-referencing and for obtaining the coordinates of features of interest present in the study area.

The aerial photographs as well as the existing maps and topographic sheets obtained were scanned and the images were brought into the Autodesk Raster Design 2006. They were merged and saved separately for georeferencing and vectorisation process. The images were uploaded and a layer was created for it and labelled accordingly. The points

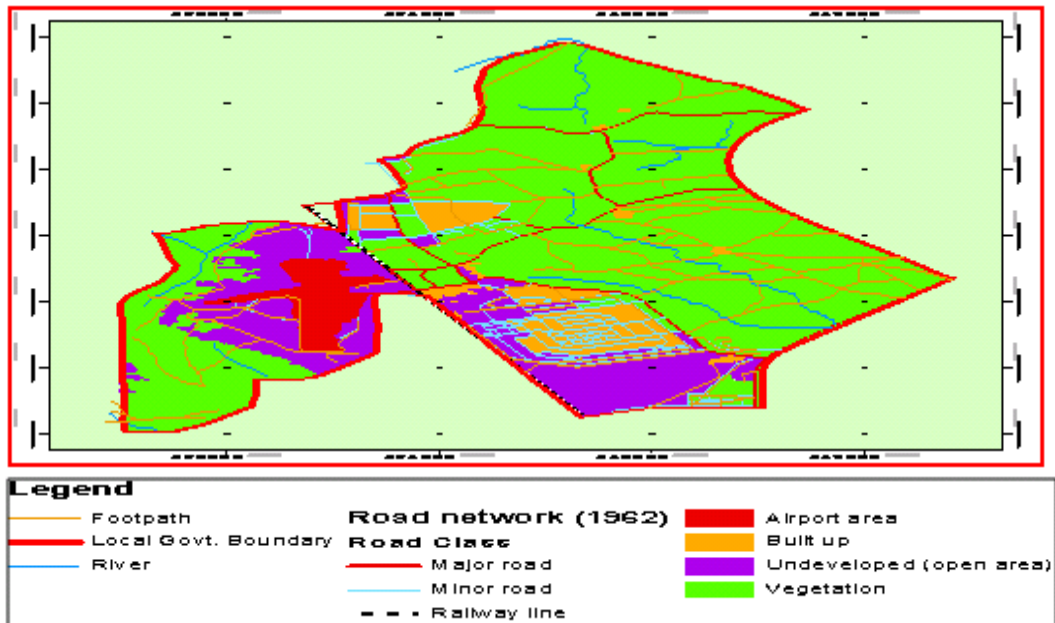
depicting similar points on the images to those on the boundary map were used in correlating by matching methods the points on the images. Once achieved, all points on the images now had relative ground co-ordinates. After the geo-referencing process, an overlaying process was carried out on the images for the purpose of comparing the features that are present on the old images that are present on the satellite images. The geo-referenced images were vectorized (digitized) online on the computer system. The imported layers from AutoCAD were separated into single symbols and converted to shape-files. This was applicable to all the points, lines and polygon themes. Layers were created for polygonal features and these layers were grouped under the built up areas, undeveloped areas or the open areas, the airport area and the vegetation area as shown in figures 1, 2, and 3.

Implementation of Geographic Information System (GIS) Design involved the linking of both attribute and spatial data together and generating queries that can solve spatial problems. ArcView 3.2a was used for this purpose of feature representation and database structuring. ArcGIS 9.2 was used for the GIS analysis and information retrieval and subsequent database implementation. Tables 1, 2 and figure 4 are some of the queried results used in the study analyses.

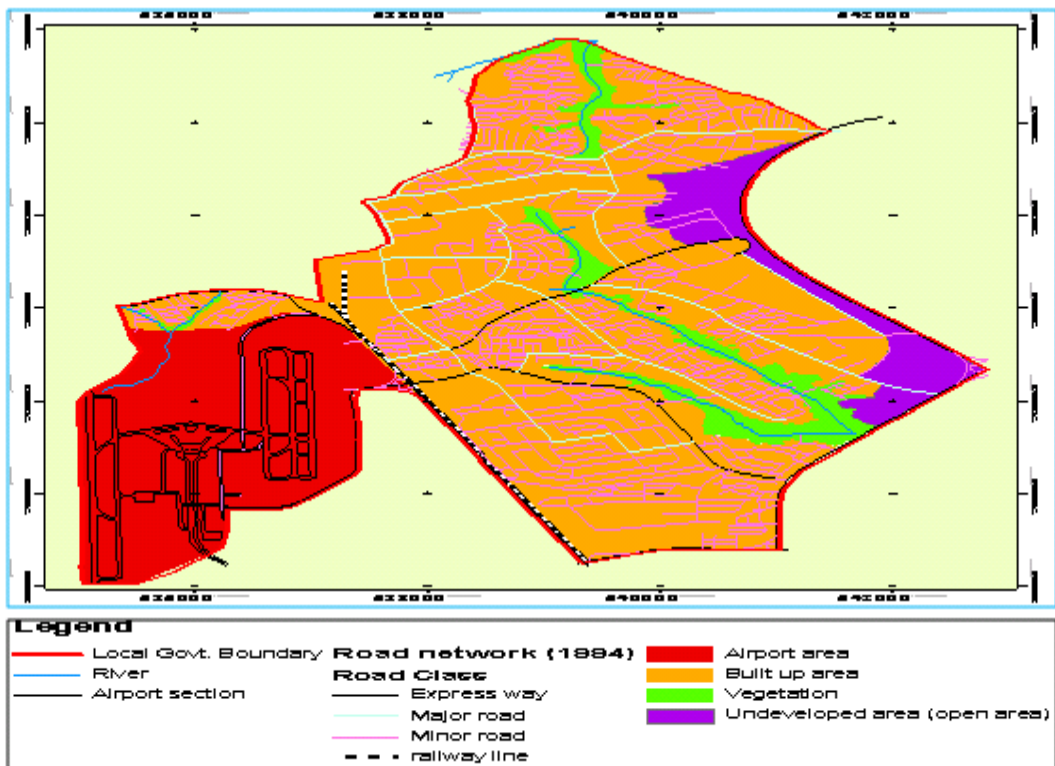
## **RESULTS AND DISCUSSION**

The results obtained from the calculations carried out for different segments of the study area were used to prepare analyses of variables common to the images used. Figures 1, 2 and 3 are the Ikeja land use of 1962, 1994 and 2004 respectively. The figures show that in 1962, Ikeja was mainly covered by vegetation with the major part of it at the north, east and south of the study area. But this is a different scenario in 1994 and 2004. It shows that land has been used up, vegetative cover is very small and it is clear that the study area has undergone a very high level of development. Tables 1 and 2 show the land use in hectares and percentages respectively. Table 2 shows that the airport area that occupies 2.5% of land use coverage rose to 22.88% in 1994 and 22.84% in 2004. The Built up area rose from 6.55% in 1962 to 63.90% in 1994 and to 67.99% in 2004. Vegetation cover decreased from 65.23% in 1962 to 6.43%, 5.97% in 1994 and 2004 respectively. Undeveloped area decreased from 25.68% in 1962 to 6.79% in 1994 and 3.20% in 2004.

Figures 4, 5 and 6 show the developmental spread of land use in Ikeja and the activities to which the land was used for. By way of categorising the uses with respect to the interested places or facilities (for this study), whilst what was obtainable in 1962 was a sparse distribution of certain classes of land use within the study area, the year 1994 (32 years after) presented an entirely different scenario, in which Ikeja was now heavily populated with several classes of land use such as the commercial/industrial, educational, recreational among others. A major factor contributing to this rise is the increased influx of people into the area over the years and possibly due to a transfer of the seat of power to the study area. The result shown in figure 6 indicates that there is still an increase in the several classes of land use, thereby making the study area more populated over the years with the commercial and industrial land use dominating the land use classes.



**Figure 1:** Ikeja Land use in 1962



**Figure 2:** Ikeja Land use in 1994

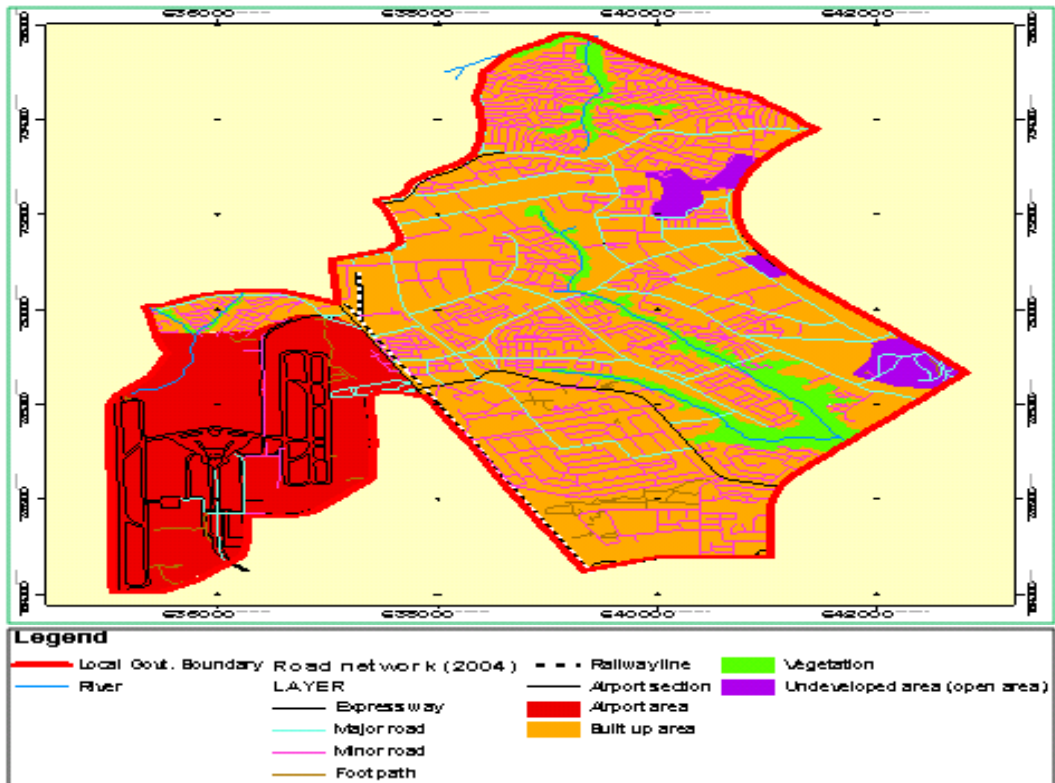


Figure 3: Ikeja Land use in 2004

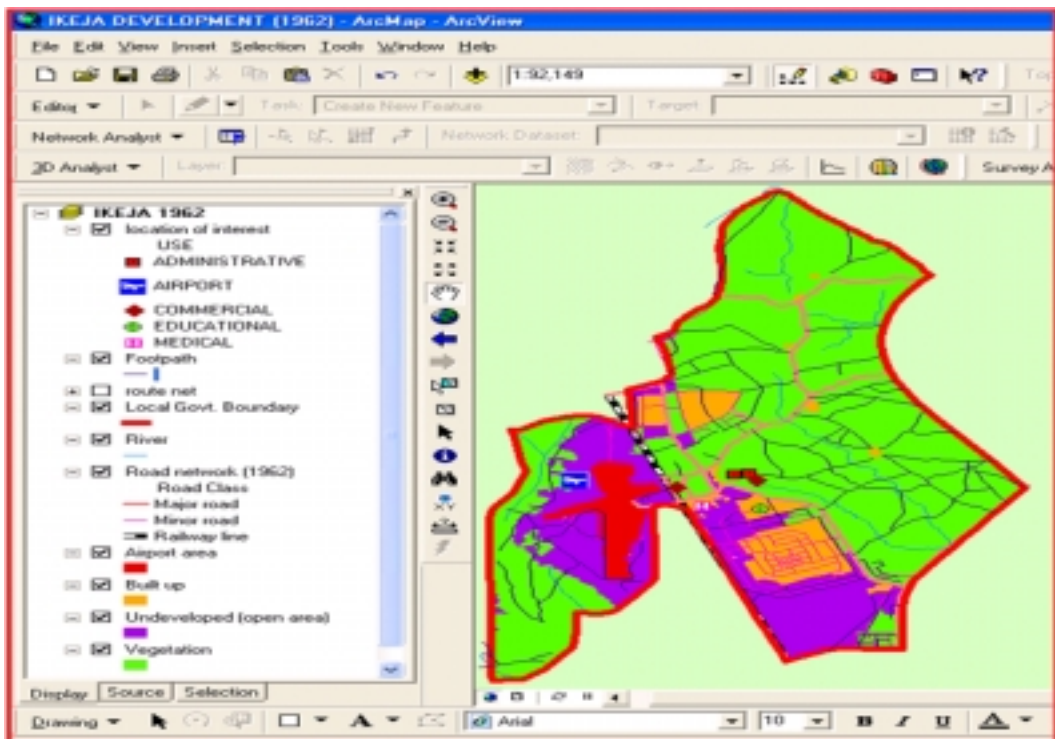
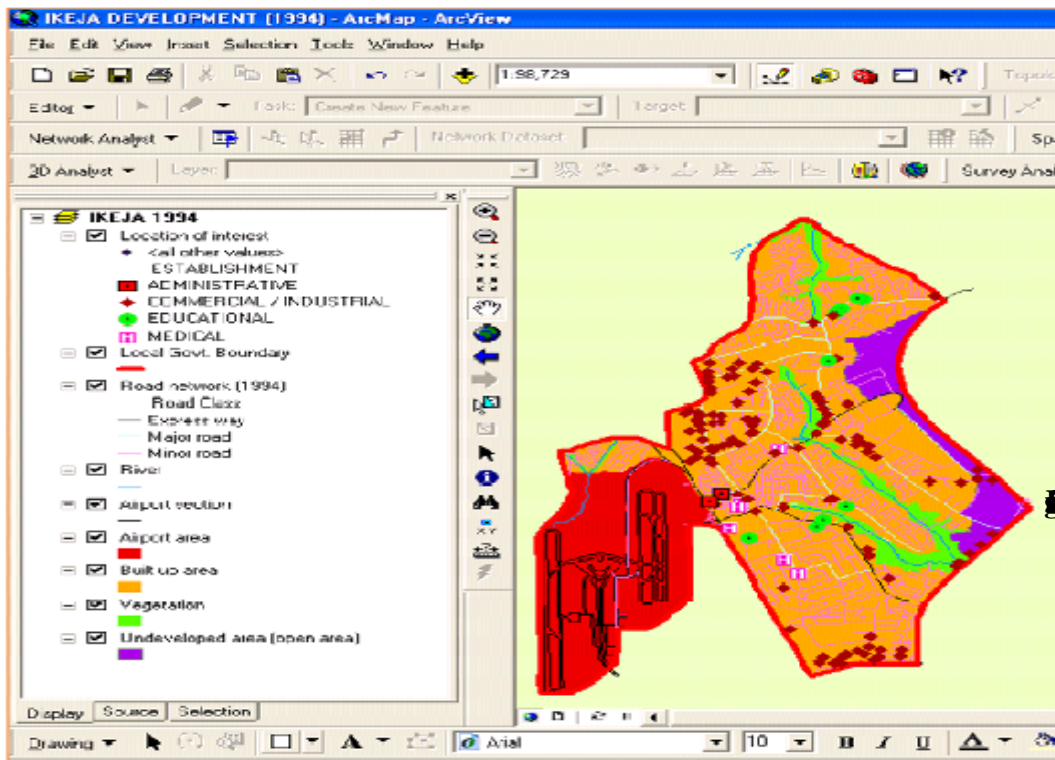


Figure 4: Land use (development) spread in the year 1962





5: Land use (development) spread in the year 1994

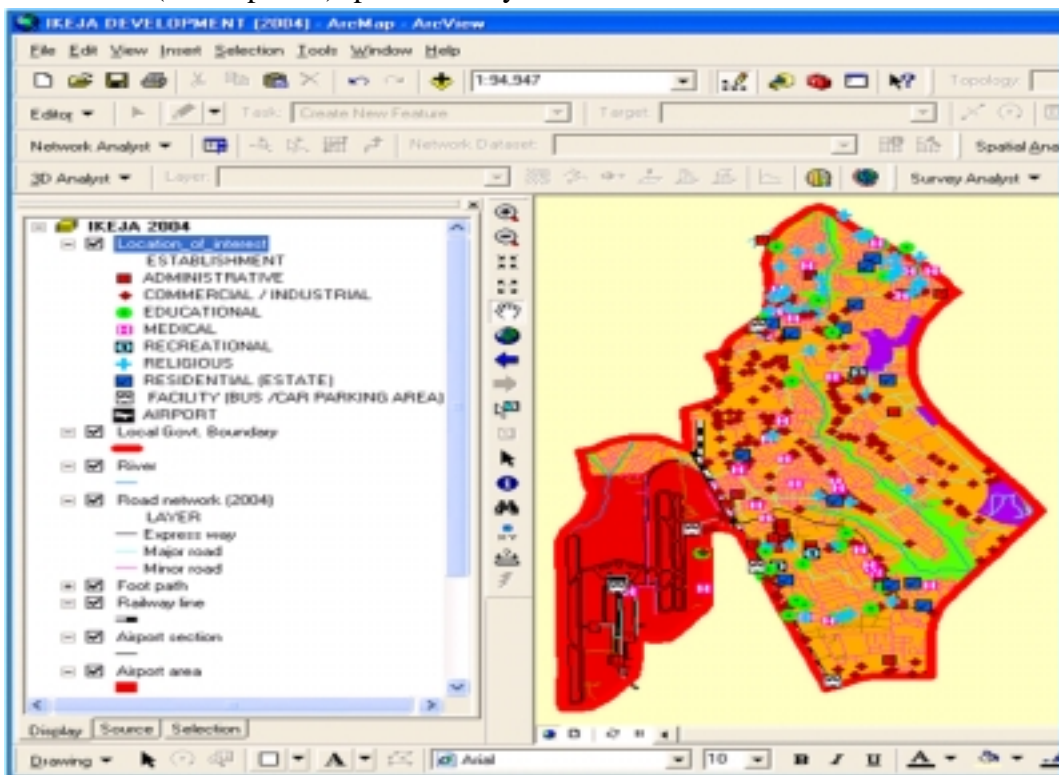


Figure 6: Land use (development) spread in Ikeja Local Government in the year 2004.

**Table 1: Land use cover or areas (in Hectares)**

Area	1962 (Hectares)	1994 (Hectares)	2004 (Hectares)
Airport Area	120.839	1087.484	1085.928
Vegetation	3100.892	305.657	283.759
Built Up Area	311.271	3037.708	3232.076
Undeveloped Area	1220.685	322.84	151.925

**Table 2: Land use cover or areas (in Percentage)**

Area	1962 (%)	1994 (%)	2004 (%)
Airport Area	2.54	22.88	22.84
Vegetation	65.23	6.43	5.97
Built Up Area	6.55	63.90	67.99
Undeveloped Area	25.68	6.79	3.20

## CONCLUSION AND RECOMMENDATIONS

It is obvious to say that Ikeja Local Government area has undergone a series of changes in land use. In the year 1962, Ikeja was predominantly covered by vegetation with the built up area typically centralised to the left (close to the airport) and sparsely distributed to the northeast and south of the study area with the undeveloped or open areas typically surrounding the built up areas towards the left. This typically explains that there was a very little or no commercial activity in the study area but it constituted more of a residential area. This is not the case in the year 1994 where there was predominantly a built up area with very little vegetation cover and undeveloped area. This was more or less the same trend in the year 2004 (10 years later) with an increase in the built up area and a decrease in the area covered by vegetation. It could be projected that by 2015, there will still be an increase in the built up area and a decrease in the undeveloped areas, which means there is the prospect of Ikeja getting to stage where there is a situation of overcrowding with little or no space left for habitation. If this is not looked into closely it will create an adverse effect on the habitat as the land is being over used and vegetation cover is decreasing with a drastic decline in the wetlands and attendant problems associated with urbanization such as urban sprawl, loss of vegetation and open space and industrial pollution. It is therefore recommended that government and other stakeholders should monitor land-use in Lagos State for effective utilization. They should provide structures and mechanisms for control of developmental activities. The town planning authority should enforce planning laws to allow for balance in land allocations. The study should be extended to other local government areas and adopted as a source for planning and management of land use pattern in Nigeria.



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